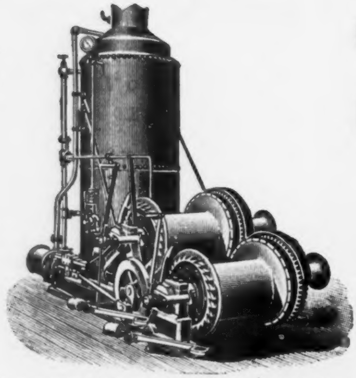
Compressed Air

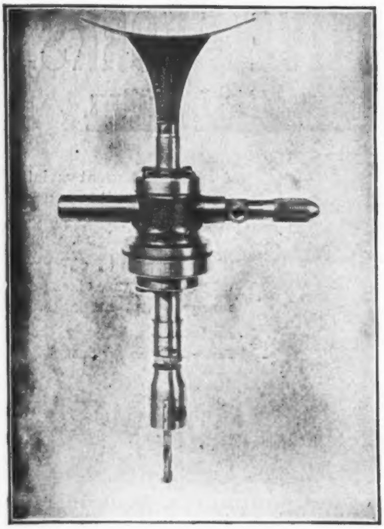
A MONTHLY MAGAZINE DEVOTED TO THE USEFUL APPLICATION OF COMPRESSED AIR.

VOL. VI. NEW YORK, MARCH, 1901. No. 1.

PNEUMATIC TOOLS AT WORK ON THE PALMER MEMORIAL FOUNTAIN.



EMPIRE AIR TOOLS.



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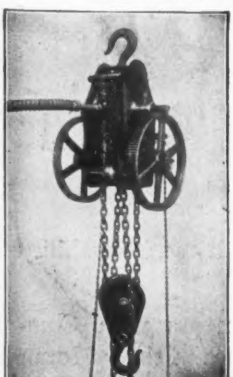

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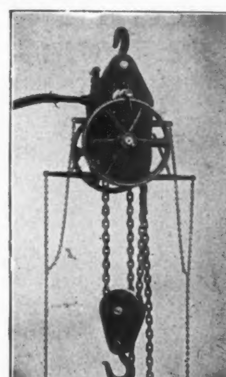

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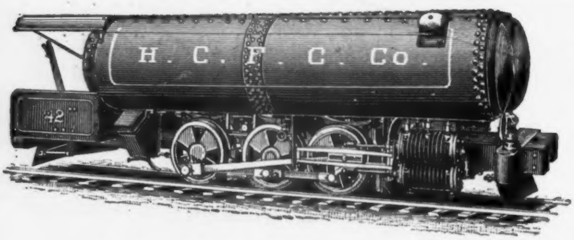

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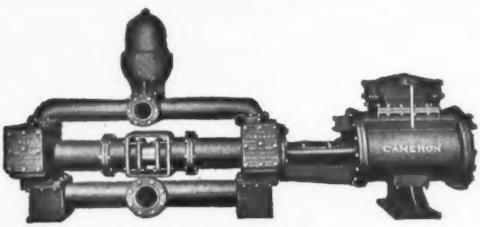
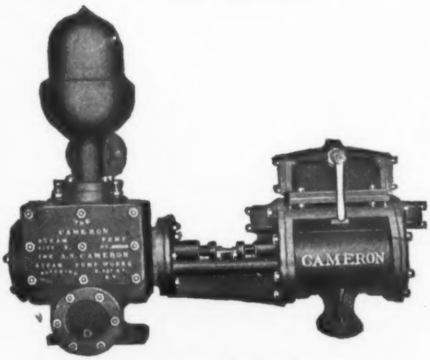


PIPE PATTERN



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VOL. VI. MARCH, 1901. NO. 1.

This is the beginning of the sixth year in which Compressed Air has been published. During this time the paper has, we think, been strengthened, though its volume has not been largely increased. We have found it advisable to expend what little surplus we acquired, along the line of securing expert and technical assistance rather than in printer's ink and paper. We still hold the unique position of being the only publication exclusively devoted to compressed air interests, and in this respect we appeal strongly to advertisers who naturally gain greater advantages from a paper which has the field to itself, than one which covers only a portion of a field, however large it may be. We aim to make this paper a compendium of compressed air information, and to concentrate in its pages all compressed air matter which is of practical value. Our chief aim is to be practical. It is so easy to be otherwise and it is so like the common newspaper to publish interesting things which attract attention, are read with interest and which are usually dangerous and misleading. It is also an easy matter to get papers which treat of compressed air on lines of higher mathematics. Such things are valuable in schools of learning and in text books, but they do not add to that information on the subject of compressed air which aids in accomplishing practical results. Hence we do not try to be theoretical beyond certain well defined limits. The past six years represent a period of important progress in compressed air appliances. Much has been learned about this subject. A great many practical results have been accomplished, and in an industrial and commercial way pneumatic appliances during this period have left a stamp upon the community and now stand as a recognized industry. The compression of air has shown economies. Six years ago the straight line air compressor with common air pressure cylinders was the standard type; to-day compound machines of the duplex pattern with intercoolers and other economical features are the preferred types. The Corliss compressor, with its high duty engine, has been brought largely into use. Even contractors who put up plants that are more or less temporary are now adopting the Corliss compressor because of its economy. In some instances that have come under our notice the saving in fuel alone in less than two years has more than paid the difference between the first cost of a Corliss and that of the common type of compressor. The common air compressor with two cylinders, one for steam and one for air, compressing to 100 pounds air pressure and with 75 pounds steam pressure, will produce compressed air at the expenditure of 40 pounds of steam per horse power hour. The same work can be done with a Corliss compound, provided the steam pressure is increased

at an expenditure of 16½ pounds of steam per horse power hour. Here is a saving of over 50 per cent., which, when converted into coal in a plant of reasonable size, represents an important item. Corliss air compressors are even being introduced into the coal mines, where fuel is cheap and where it is a common thing to say that coal costs nothing. This has been done only in large plants, and in addition to the fuel saving there is an added advantage of a safer machine, one which is less liable to accident and which lasts longer. During the past six years air compressors of large sizes have been installed and are now in operation compressing air to 3,000 pounds per square inch. An instance of this kind is the large installation at West Twenty-fourth street, New York, driving about twenty pneumatic street cars. This is the first installation of consequence and the first experiment of magnitude of this kind which has ever been tried in this country. Whatever criticism may be made against the motors no one disputes the fact that in this installation the generating plant is a success, and that compressed air at high pressures is produced there at low cost. This is because the apparatus combines the compound condensing Corliss engine with the compound intercooling air cylinders.

Pneumatic tools have been developed mostly during the past six years. Today the pneumatic tool business is important and profitable. There are several large concerns in the business. Pneumatic tools are more common than rock drills, and the machine shop which does not use them is not considered up to date. Practically all boiler and bridge work is done by the pneumatic tool. Several railroad yards of magnitude are equipped with pneumatic devices for lifting, switching, chipping, boring, riveting and painting. This American invention has been applied abroad during the past two or three years, and at present most of the shipyards in Scotland are equipped with these tools. We have referred only briefly to switching in railroad yards by compressed air. This is now an important invention in the railroad business, perhaps next in importance to the air brake. The adoption of the pneumatic switch and signal by the great Pennsylvania Railroad, New York Central and other standard American roads removes any doubt as to the value of this system.

Pumping water by compressed air, though introduced prior to six years ago, has made progress during this period and has become a recognized method of pumping water. We will not dwell upon this subject, because our readers have been fortunate enough to learn all the details pertaining to pumping water by compressed air through recent issues of this paper in an article written by Mr. Edward A. Rix, of San Francisco. Mr. Rix has handled this subject in a masterly manner and has covered the field thoroughly. His paper has been put in book form, and for further particulars on this subject we refer to our advertising columns.

Pneumatic dispatch, that is the conveying of parcels, mail, packages, etc., by compressed air, has been brought to a point of commercial success during the past few years. The Batcheller system, which is most largely used at present, has been installed in New York, Philadelphia, Boston and other places, and is now in constant service.

Liquid air deserves mention here as an important scientific discovery only. This is as far as we go in our views of liquid air, as readers of this paper know that we have not been a party to the extravagant claims made for this discovery. It is to be regretted that the knowledge gained by the discovery of liquid air

should have been diverted into the direction of catchpenny schemes and exaggerated claims. So greatly has this subject been abused that competent persons now fight shy of it. Liquid air has been too closely associated with Keely motor ideas, and we have no doubt that many experimenters who might otherwise have achieved practical results out of it have dropped all consideration of the subject.

We show on the front page an interesting application of the pneumatic tool at work carving the Palmer Memorial Fountain, which is now nearly completed. The memorial is to commemorate the late U. S. Senator Palmer of Michigan.

Pneumatic Tools and Appliances in Foundry Service.

BY MR. W. P. PRESSINGER, NEW YORK, N. Y.

In discussing the employment of pneumatic tools and appliances in foundry work, it is not my purpose to describe any device not perhaps familiar to you all, but rather to present, in as brief and collective a form as the subject permits, the various appliances which have lightened labor and reduced costs in foundry service that are dependent upon compressed air as their actuating medium.

The introduction of pneumatic tools in a form marketably perfected for shop or foundry usage dates back but a few years, and their wide-spread adoption, remarkable for its rapidity, is, after all, the most convincing proof of their commercial value. To-day a boiler shop or machine shop devoid of compressed air equipment is a rarity, and if the foundry end of our mechanical community is not so well provided for, I venture to say that it is because the merits and labor-saving properties of pneumatic machinery have not, in the rapid development of the business, been as thoroughly demonstrated to the foundry trade. The day is near at hand, however, when a foundry without pneumatic equipment cannot produce its output in commercial competition with foundries that have adopted it.

The best known and most widely employed foundry appliance actuated by compressed air is the pneumatic hoist, originally used only in the straight lift, piston and cylinder form, but now utilized in a variety of types.

The accompanying view shows collectively the vertical hoist and the horizontal style, the latter being desirable when available head room is scant. The horizontal hoist may be arranged for a lift of 2 feet or 4 feet for each foot of piston travel, when desired. Operated by a simple three-way valve, with no complicated mechanism, these hoists are well nigh indispensable for duty not requiring an immovably sustained load. For this latter demand, where irregular action is not permissable, a more refined type of hoist is obtainable in which the incompressible qualities of oil are used to govern and restrain the sometimes too elastic properties of compressed air. This is accomplished by providing the hoist with a hollow piston rod filled with oil, thereby preventing a more rapid movement of the piston in its upward travel than emission of the oil through the necessary controlling valve will permit. This form of hoist eliminates that element of danger which otherwise would be present in handling vessels of molten metal, and also permits a sort of elastic positiveness which is so essentially desirable. In the actual work of molding, as in lifting copes and molds, drawing patterns and moving cores, the air hoists will do 50 per cent. more work in an easier and better manner, without the danger of losing castings and with considerable saving in repairs. The peculiar adaptability of this device, properly rigged, as a drop or casting breaker, is apparent, since it is evident that the sudden release of the load could not possibly effect the regular and even progress of the piston in its return stroke. This machine will break three-half-pigs into three pieces each, in one minute, and can easily break 20 tons of pig while a man is breaking up one ton by the old sledge method.

The Motor Chain Hoist is a more recently developed appliance, intended for similar service, and embodies compactness of form with rapid, even speed and perfect regulation. It consists of the motor familiar to all users of pneumatic drills, so combined with a chain hoist as to permit quick movement, accurate suspension of

load and prompt reversibility. One of the latest types operates the motor in a bath of oil, avoiding the annoyance sometimes due to insufficient lubrication because of the inaccessible location in which the hoist must operate. These hoists, with adequate pressure, are made in sizes to lift up to 10,000 pounds in weight, at speeds varying from 10 to 36 feet per minute.

A most useful foundry appliance, familiar to you all, is the Pneumatic Hammer for chipping castings; in fact, so general has become the adoption of this invaluable tool, that the mere presentation of it in the accompanying views, showing a few of its best known forms of application, will suffice, supplemented by the general statement that one man with one of these tools will customarily do the work of four men following the old methods.

The Air Drill is another very familiar labor-saving device in some classes of foundry work, though more peculiarly a tool possessing a wide variety of usefulness in the shop, where for drilling, reaming, rolling flues, and other applications seemingly limitless, it has established itself, next to the pneumatic hammer, as the most generally used type of air tool. When a large, heavy casting is to be broken up for return to the cupola, a small pneumatic drill may be advantageously used to drill a suitable number of small holes into which may be inserted a round taper steel wedge which, with a few well directed hammer blows, will sever the piece into parts suitable for remelting.

The application of the drill motor equipped as a casting cleaner, will appeal to you as a saver of labor and money without further argument when its immense speed and power are considered.

PNEUMATIC HAMMER FOR CHIPPING CASTINGS.

One of the most recently perfected pneumatic devices suitable only to foundry requirements is the Pneumatic Sand Rammer, now shown in its most improved form. Accurately counterbalanced, the weight of this tool completely rigged is not quite 300 pounds, and operated under an air pressure of 40 pounds per square inch it will deliver an average of 300 blows per minute. The maximum stroke

is 7 inches, but the length of stroke and consequently the number of blows delivered, may be changed at the will of the operator by simply varying the proximity of the rammer to the work. It is estimated that a greater quantity of sand can be rammed in a more effectual manner by this machine than five men can do by hand.

Passing from the Sand Rammer, possibly the newest of pneumatic contrivances to serve the foundryman's needs, we reach what to me seemed to be the oldest and one of the most widely known, though perhaps not most widely used, of them all —the Pneumatic Sand Blast. Embracing a broad field of application and in some way adapted to the needs of almost every known form of foundry work, the adoption of the Sand Blast has been retarded somewhat through patent limitations and ultra-conservative methods of introduction. Another objection has been its wasteful utilization of what was formerly a most expensive commodity—compressed air—but this element of criticism is eliminated in a great measure because of the rapid strides in the development of economical and efficient air compressing machinery. The value of the Sand Blast for foundry use, if obtainable at proper operating cost, being universally conceded, I will sum up my reference to this device by quoting from the pamphlet of a manufacturer, treating the subject from an argumentative standpoint:

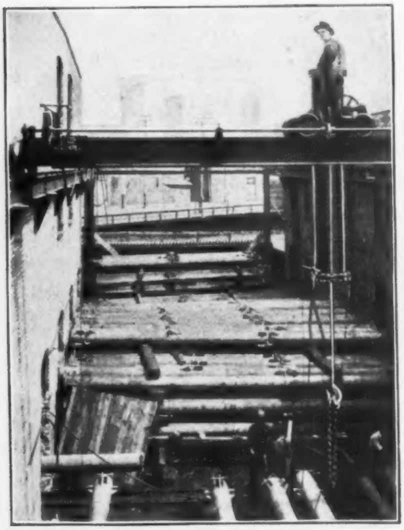
"The question is asked, does the Sand Blast pay, for foundry use? And is answered with the qualification that it is difficult to approximate on general work. The argument continues, that on ordinary iron, steel, brass and bronze castings, one man operating a Sand Blast apparatus consuming 120 feet of cubic air per minute, will clean more surface and remove more cores in a given time than is possible for from six to ten men to do with the hammers, chisels and brushes, and the finished work left by the Sand Blast is infinitely better than can possibly be produced by hand laborers. Burned sand or scale is removed rapidly by the blast, and not only does it effect a great saving in time and labor, but a further saving is effected on castings to be machined; the removal of the oxide in itself is a great saving on tools, and in many cases the tools can be run at an increased speed. This applies particularly to milling cutters. Difficult and intricate cores are readily removed, and in cleaning steel castings in which large quantities of wire nails are used, the sand is eaten away first, and subsequently the nails will fall to the ground, sand blasted, perfectly clean, and in condition to be used over again. In a number of foundries where the Sand Blast has been introduced the use of facings has been discontinued. In some cases the only objection, in fact, that has been made to the Sand Blast is an unpleasant habit of making defects too plainly discernable."

PNEUMATIC HAMMER FOR CHIPPING CASTINGS.

Another recent improvement in connection with the Sand Blast is the application of it in conjunction with tumbling barrels. These barrels run very slowly

and consequently there is slight risk of breaking a fragile casting; neither are the edges of them worn off and destroyed, as in the case of ordinary rattling at high speed. The castings are not cleaned by tumbling, but by sand blast inserted at one or both ends of the barrel. The usual time consumed in cleaning a charge of this barrel is from 20 to 30 minutes.

The device next is a Pneumatic Sand Sifter, representing another method of utilizing the air drill motor for the needs of the foundry. With compressed air available for its operation, the value of this apparatus through saving of labor and attention becomes readily apparent. It can be removed from place to place in the performance of its work, saving the time and labor otherwise required to convey sand to a fixed sifting point.



PNEUMATIC CRANE IN PIPE FOUNDRY.

I have refrained purposely from any detailed reference to the Pneumatic Moulding Machine, a most important feature of compressed air foundry equipment, because the economy and value of this device have been so recently placed before you in a paper devoted exclusively to the subject. Suffice it to say that the Pneumatic Moulding Machine presents in itself a most potent argument for the introduction of the air compressor in foundry service.

The Pneumatic Painting Machine is a simple form of compressed air device deserving a place in this paper, because of its exceptional economy for painting the interiors of foundry buildings. One man with this handy utensil can cover more space and distribute the paint more evenly than four men using ordinary paint brushes. The air consumption is moderate and the results all that can be desired.

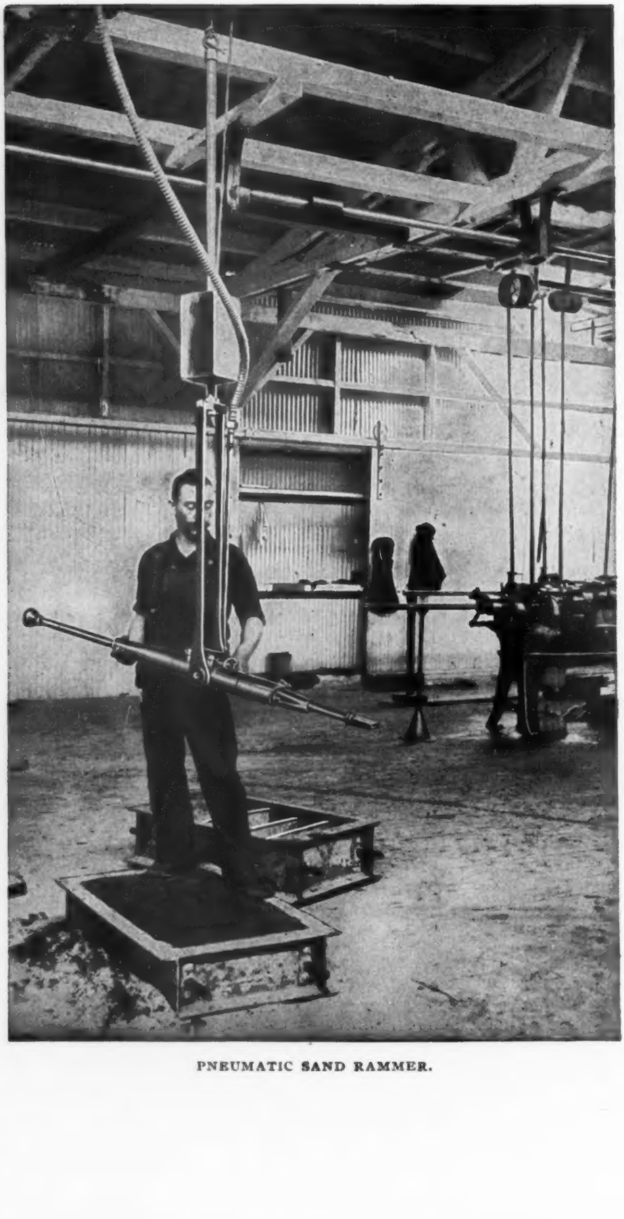
There are, of course, numerous special employments of compressed air in foundry work peculiarly adaptable to individual conditions, but not of general interest or application, reference to which is not within the province of this paper, but such applications suggest the inevitable conclusion that when once you have compressed air available, the number of convenient and economical possibilities that it presents to the progressive operator is surprising, and its field of usefulness in your service broadens with amazing, but none the less gratifying, rapidity. Second only to electricity in its fascinating possibilities, compressed air yields nothing to electricity as a power with properties peculiarly its own, inimitable and unsurpassed in the commercial development of our time, and with the constantly rising standard of efficiency in air compressing machinery, that most important source of power which regulates the value of pneumatic appliances, more widespread adoption is inevitable. Imperfect and wasteful air compressors, possessing the primary virtue of cheapness, but with all the faults in the mechanical calendar, will do more to offset the resultant value to be derived from the use of pneumatic foundry equipment, than labor antagonism, either secret or expressed. Therefore, to derive the utmost benefits from the installation of compressed air machinery, the selection of a compressor should be carefully considered. It is unwise to install a compressor just about equal in capacity to present requirements, good practice being to provide a compressor at least 50 per cent. greater in capacity than immedate necessities demand. Compressors of the duplex type are divisible, permitting the installation and operation of one-half at first, and the other half when the additional capacity is needed. The theoretical capacity of an air compressor stated in the list of the

maker, is not the equivalent of the actual volume of air needed for the service. All makers list their compressors according to theoretical measurement, but the efficiency of the compressor is determined by the volume of air actually delivered with

PNEUMATIC DRILL.

PNEUMATIC CASTING CLEANER.

a given consumption of power. The cheap air compressor usually proves the most expensive. If a water pump fails in its work, or if a steam engine is deficient, the short-comings are self-evident, but if an air compressor is poorly designed or badly constructed, it may continue in the evil of its ways until the scrap heap claims it for its own; unless, as is more likely, an absolute breakdown calls attention to its deficiencies and shows, all too late, that the hole it has made in the coal pile, added to the cost of keeping it in repair, would have paid a handsome interest on the additional first cost of a properly designed and properly constructed compressor. Sec-



PNEUMATIC SAND RAMMER.

ond-hand compressors are poor investments, unless known to have given satisfaction in service similar to that for which intended, and, in any case, the working parts should be carefully examined to see that they retain their full measure of usefulness An air compressor with valves, pistons, etc., worn out or in bad repair, can waste a great amount of power.

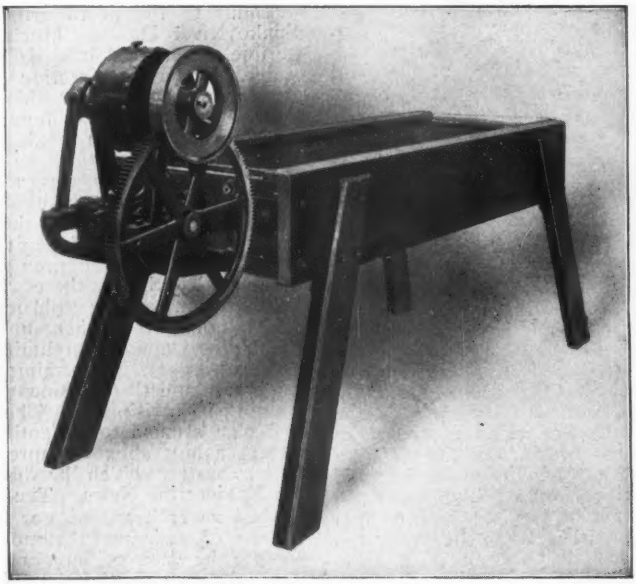
PNEUMATIC PAINT MACHINE.

The use of air brake pumps and direct-acting compressors is very bad practice, as statistics show that their steam consumption is about five times that of a crank and fly-wheel compressor for the same volume and pressure of air delivered. Install a steam-driven compressor, if your steam supply is plenty; otherwise a belted compressor may serve best.

Intake air to the compressor should not be drawn from a hot engine room, or from any point where dust is abundant. The volume of air delivered by the compressor increases proportionately as the temperature of the intake air is lowered, and dust or grit entering the compressor clogs the valves, cuts the cylinders and generally impairs the efficiency.

The selection of an air receiver should have careful consideration. Compressed air under 100 pounds pressure will leak a horse-power through a 1-16 inch diameter hole in five minutes, and a well-made, strong and tight air receiver is the second essentially important factor if you would realize to the utmost all the advantages which compressed air provides.

Test the air-piping under full pressure when it is installed and at regular intervals thereafter, allowing the pressure to remain an adequate length of time, and if the gauge indicates leakage, locate and remedy it. To secure the best results and eliminate moisture from the compressed air, connect your pipe leading from the compressor to the top of the receiver, and lead your air pipe to points of consump-



PNEUMATIC SAND SIFTER.

tion from the bottom of the receiver. Proper provision should be made for draining condensed moisture at regular intervals in the system. The simplest method is to slightly incline the branches leading from the main line and insert drain cocks before the hose connections are reached. In pneumatic equipment, as in all things else, the proverbial ounce of prevention saves the pound of cure. Experienced knowledge which the compressor maker or pneumatic tool manufacturer is ready to provide, coupled with sound calculation, will assure the highest results and utmost economy. Whether to put in a steam-driven or belt-actuated compressor; whether it should be of the duplex or single type and have simple or compound cylinders; where best to locate the compressor and where to place the receiver; what size of receiver is adequate; whether the size of the plant warrants provision for reheating the air—all these are points requiring careful consideration. In installing pneumatic equipment it is generally desirable to procure the entire outfit from one source. Thus, division of responsibility for the successful operation of any feature of the plant is avoided, and one guarantee covers everything.

A Hydraulic Compression, Transmission and Pumping Plant Without a Moving Part.

BY A. D. FOOTE, MEM. AM. SOC. C E.

So much is being published and so many patents are being taken out concerning Hydraulic Air Compression that a description of a Hydraulic Air Compression, Transmission and Pumping Plant erected in 1893-94 may be of interest, especially to the recent patentees.

About twenty-five miles southeast of Bliss' Station, Idaho, on the Oregon Short Line Railroad, the north bank of the Snake River forms a bluff some 300 feet high. The upper 100 feet of this bluff is composed of lava; the lower 200 feet was once the bottom of a lake. Near, but above the junction of these formations, water gushes out of the lava as out of a sponge and forms in streams and jets falling nearly perpendicular to the river below. The lava has a yellowish gray color exactly resembling a petrified sponge, and the water oozes from it as if squeezed out. The Thousand Springs, as they are called, extend for several miles along the river, but are principally concentrated within a distance of perhaps 2,000 feet. In this distance over 1,500 cubic feet per second of water is continuously falling 200 feet to the river, forming not only an ideal water power, but one of the most interesting and beautiful scenes on the continent.

For 300 miles along the north bank of the Snake River, from Shotgun Creek to the Malade, not a sign can be found of water ever having flowed over the surface to the river. The Snowy Range to the northward has rivers and streams that flow down to the edge of the desert and disappear in the fissures of the lava. The old lake bed holds them up and by devious ways and tortuous passages they filter through the lava and form the vast reservoir which supplies the unchanging flow that gushes from the canyon wall. From the top of this wall or bluff to the northward extends the Snake River Desert. Much of it would be fine agricultural land if supplied with water. Under the direction of the writer surveys were made for this purpose in '91 and '92, but it was found that there was no land which could be reached without pumping.

In '93 the writer was again investigating this ideal water supply for power for electric transmission, though it is a hundred miles from the mines where it could be used. A young engineer named William Priestly was there with one man helping him, soldering old iron pipes together and putting them up the face of the bluff to make a preliminary trial of compressing air by entraining it in falling water and then raising water by entraining it in rising air. The whole idea and plan seemed to be entirely original except a hint about compressing air in falling water, which he had found in the Engineering News. The air lift pump he had never heard of, nor had he ever known of assisting a pump by forcing air into the water column, and he thought it absolutely essential that his apparatus should be vertical. When assured that his preliminary trials were unnecessary, that his column need not be vertical, and that water had actually been lifted up an incline by compressed air, his delight was simply comical, for he had the

true engineer's instinct, thinking only of the success of his machine and not of who found the way.

The accompanying photograph, having been taken from below, make the bluff appear much less vertical than it should otherwise. They render a description hardly necessary.

It was an easy matter to excavate along the water bearing stratum and collect the exuding water in a flume which was supported in a convenient ledge, and carry it to the upper end of a U shaped pipe which rested against the bluff. This pipe formed his air compressor and delivered the air into the reservoir shown by entraining it in the falling water in a manner precisely similar to the Taylor Hydraulic Air Compressor at Magog, Quebec, installed in 1896. From this reservoir the air was transmitted to the second U shaped pipe, which was filled by water from the same source as the first, and arranged as in the Pohle Air Lift pump, the rising air entraining the water and carrying it up and over the bluff.

Here, then, in 1894, was successfully working a hydraulic air compression, power transmission and water raising apparatus, all without a moving part, invented and built by young Priestly almost alone with his ideas, in the middle of the sage brush desert of Southern Idaho.

Like nearly every other irrigation project in America, it was not a success financially and was sold by the Sheriff in a few years—a not uncommon reward for the engineer who "breaks the trails."

WATER BEARING STRATUM.

Portable Pneumatic Tools.*

PART I.

EWART C. AMOS, M. I. M. E.

The engineering industry at the present time is enjoying a period of activity quite unprecedented in its history, and, as a consequence, is calling for an immense increase in the number of its labor-reducing machines. Prominent among these are portable pneumatic tools and appliances. They have been used in America for a considerable time, although in this country, with certain exceptions, they have not been so well appreciated until the last few years, and considering their importance and the valuable assistance they are rendering to the shipbuilding and many other industries, it is somewhat singular that comparatively little information has been circulated about them, except by trade descriptions.

At the same time, the subject is by no means a new one to some who have used pneumatic tools for some years past, but it is hoped that the various tools described and illustrated in this paper may be of interest as showing what has been achieved up to the present date. The various tools which can be driven by compressed air are many, and are rapidly increasing in number; but it is proposed only to refer to portable hammers, riveters and drills, making also a very brief reference to hoists and other appliances driven by compressed air.

Hammers.—Since the mechanism employed for utilizing compressed air to secure a percussive action is essentially the same in both hammers and riveters, it will be sufficient to describe the mechanism in one of them only, and for this purpose the hammer will serve. Plate 1 shows several improved forms.

Hammers may broadly be divided into two types, namely, the valveless hammer and the valve hammer. This is a convenient description, yet perhaps not strictly correct, because, although the valveless hammer has no valve beyond the striking piston, this is itself a valve to effect the proper admission of air to alternate ends of the working cylinder; while in the valve hammer, a reciprocating valve, working either at right angles to or parallel with the striking piston, acts in combination with it to regulate the inlet and exhaust of the compressed air.

Valveless Hammers have essentially a short stroke, and although economical in air consumption in relation to the number of blows given, they will not compare with valve hammers in giving powerful blows, which are necessary in heavy chipping or riveting. Owing, however, to their simple construction, they have probably a longer life than the valve hammers, and for such purposes as beading flues, light caulking and chipping, and especially carving in stone, etc., they compare very favorably with their rivals. The speed of the valveless hammers is very high, being 10,000 to 20,000 strokes per minute.

Valve Hammers will probably secure the market for general and heavy chipping, caulking and riveting. Their speed for ordinary work ranges from 1,500 to 2,000 blows per minute, although they can be driven much faster. Their stroke, however, is considerably longer than that of the valveless hammers, and the blow struck correspondingly harder.

There is more air lost in the ports, but other advantages, including better control for using the air expansively, overcome this small defect. It is well known that the nature of a blow (whether light or heavy) on various materials, produces an effect apart from the actual work done as measured in foot-pounds. For example, 10,000 small blows representing a certain number of foot-pounds might fail to produce a desired result, which a smaller number of heavy blows, representing less energy in foot-pounds, might effect.

Having now considered the claims and advantages of the different types of hammers, all of which it may be stated can be worked economically at from 60 lbs. to 80 lbs. (*100 lbs.) per square inch, reference must be made to the illustrations in order to explain their construction and action under compressed air.

"Ross" Hammer.—Fig. 1 shows in section a "Ross" hammer, in which the striking piston becomes the valve to control the admission and exhaust of the air.

***Abstract of a paper presented at the meetings of The Institute of Mechanical Engineers, London, February and March 22, 1900, and printed in the Proceedings of The Institute.**

[*Ed.—Manufacturers of tools are asking for 100 lbs. as a result of harder material being used in rivets and boiler plates.]

PLATE I. TYPES OF PNEUMATIC HAMMERS.

A represents the outer casing, made from solid drawn steel tube, bored and fitted with a phosphor bronze liner B, which forms the cylinder in which the piston works; E, the striking piston made from a steel forging, ground to fit the cylinder; D, the exhaust ports, open to the atmosphere through the valve G; C and P, the admission ports, admitting live air to alternate ends of the piston; K, another port always open to the air supply; G, the exhaust valve; H, the trigger actuating the same; F, the phosphor bronze handle, to which live air is admitted at the point F^1; L, a piston cushion, has always full and constant pressure behind it from the air supply through the port L^1; and M shows the working tool.

It must be noted that this hammer is caused to work by the opening of the exhaust, and not by regulation of the admission. The direction taken by the air under pressure, when connected to the handle at F^1, will be readily seen by noting the arrows. The piston is slightly reduced in diameter in the middle, and the inside edges of the two collars thus produced form the cut-off edges for pressure, while their outsides govern the exhaust ports. It will be readily seen that, when the piston is in the middle of its stroke, there is a dead point, the live air only finding admission to the chamber formed by the reduced portion of the piston, since the ports C and P are both cut off from admission of live air, but this does not interfere with its proper working, as the lap is very small. Moreover, when starting, the piston will fall either to one end of the cylinder or the other by gravity, and when at work the momentum carries it over the dead point. The diagram shows the front exhaust-valve open, and the piston just commencing to make its forward stroke. Air flows through K, thence through C, passing between the annular space formed between the liner and the outer casing, and through C^1 to back of piston thus driving it forward. At the same time, exhaust takes place from the front of the piston through D. The same action takes place on the rearward stroke, when the forward ports P and P^1 are then in communication with K. In order, as far as possible, to eliminate vibration, a condition which is present in all hammers, the cushion piston L has been introduced at the rear of piston.

"Q and C" Hammer.—Fig. 2 shows in section a "Q and C" single hammer. A represents a bronze handle, into which is fitted the steel liner B, which forms the working cylinder; C, the striking piston, which acts as its own valve; D, the outer cap, connecting the liner to the handle; E, the throttle valve; F, the trigger actuating same; and G, the point to which the air supply is attached. The action of the hammer on the trigger being depressed is as follows: The air having passed the valve E flows along the passage d, and through a large air-port into the cylinder or pressure chamber; this has the effect of maintaining a constant pressure under the shoulder of the piston, and tends to drive it backward. When, however, the ports b in the piston C, which are also large openings, come into communication with the cylinder, the pressure fills the hollow portion of the

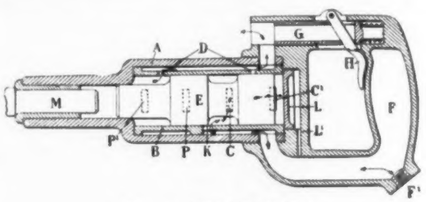


FIG. I. ROSS HAMMER.

piston and the cylinder in its rear, driving the piston forward to strike its blow. At this instant, however, the piston ports come into communication with the exhaust port c, when the pressure under the piston shoulder again returns the piston and the blows are repeated in rapid succession—it is stated as many as 10,000 to 20,000 per minute. It will be noticed that in this arrangement of ports the air is used expansively. The same type of hammer is made in a modified form, being provided with a second piston placed in the rear of the other, the air working between the two pistons for the forward stroke. It is claimed for this that vibration is reduced to a minimum.

Coming now to the valve hammers, to describe them briefly, and the same time accurately, is not an easy matter, because although they are simple in action and not excessively complicated with regard to the number of working parts, yet their movements and arrangements of ports are such as to make their description somewhat difficult.

The action of the tool is as follows: Air under pressure having been admitted by operating the valve H, passes through the opening e, and under the head of the valve E, thus forcing it into the position shown in Fig. 3. The air is then able to pass into the cylinder, through the opening e^1, and thus forces the piston forward into the position shown in Fig. 4. It will be noted that the piston is reduced in diameter at b, which together with the cylinder forms a chamber b^1, so that as

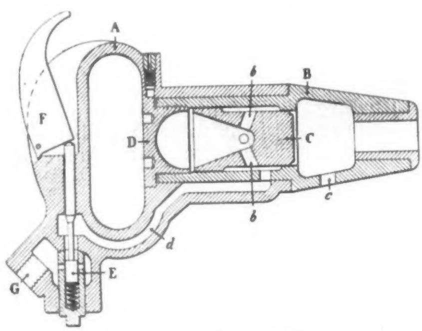


FIG. 2. Q. & C. HAMMER.

the piston nears its forward limit of stroke, air pressure enters the chamber b^1 from the passage a^1, which is in direct communication with space e. At the same time the passage a^2 is brought into communication with b^1, and thus the air passes along to the top of the valve E, and forces it into the bottom position as shown in Figs. 3 and 6. When the valve is in this position, a clear way for the compressed air is open to the front end of piston through e, e^3, and a^3, thus effecting the return of the piston. Thus far the live air admission has been dealt with to drive both piston and valve in both directions. Coming now to the exhaust and taking the piston in its rearward motion first, the air escapes along the passage a^4 and through the openings e^4 in valve and out through e^6. In its forward motion the piston exhausts first through a^7, which leads direct to outer atmosphere, see Fig. 5 When a^7 is passed, the air escapes through a^3, which is open to atmosphere through e^3, e^4 and e^6, when the valve E is up. The exhaust of the valve is effected thus:—During the backward movement of the piston and as its annular portion is passing the orifice of a^2, it permits the air pressure on top of valve E to escape through a^2 and a^5 into b^1, and a^6 and a^7, to atmosphere, with the result that superior pressure under valve head from e again lifts the valve. The valve is forced into its bottom position due to its area on the top being larger than the ring underneath its head. It is obvious that both the striking piston in its backward stroke and the

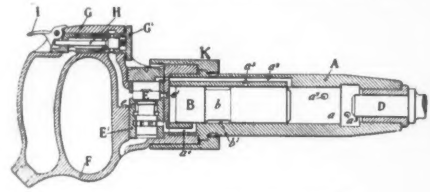


FIG. 3. "LITTLE GIANT" HAMMER. LEFT HALF.

valve in both directions should receive some form of cushioning, so as to reduce shock, and prevent injury to valve and cylinder. In the piston this is effected by its closing the port a^4 before the end of its stroke. In the valve the desired cushioning is secured in its upward stroke by means of the boss e^{10}, which causes the air to escape rather slowly into a^2. In its downward stroke the cushioning is effected thus:—The portion of e^8 of the valve E is of a diameter nearly equal to the small bore of the valve bushing, and there is also provided a small groove e^9, Fig. 5. When the valve is moving down, the portion e^8 first enters the small bore of the valve chamber, and this tends to retard the passage of the air through the bore, and permits the excess of air to act as a cushion. Up to a certain limit the same hammer may be used to give light or heavy blows, and this may be effected by regulating the amount of opening given to the throttle valve. It is not desirable, however, to simply rely upon the trigger to do this, but preferably to provide a regulator, so that however hard the trigger may be pushed it only opens the valve the desired amount. In the "Little Giant" hammer this result is obtained by making the throttle-valve bushing in two portions, G and G^1. The part G is fixed to the handle whilst G^1 is capable of being screwed in or out. The effect of this adjustment, when taken in combination with the valve H and the trigger I, is such that when G^1 is unscrewed, the port g^1 may be moved into such a position that the valve H can be

pushed by the trigger I to the limit of its stroke without uncovering the port g^1 at all, and by adjustment of the part G^1 any desired opening may be given for the admission of air. In order to put the valve H in equilibrium a small opening admits the compressed air to either side of it, which, together with the spring shown, effects the desired result. It will be ob-

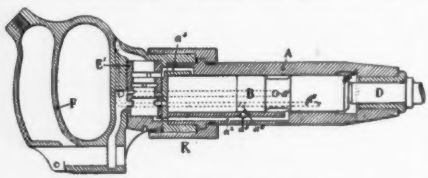


FIG. 4. "LITTLE GIANT" HAMMER. RIGHT HALF (INVERTED).

vious that fewness of parts, and especially of joints, are desirable in the construction of a tool using compressed air at a high pressure, since the possibility of leakage is thereby considerably reduced. The question of joints is of necessity more difficult to deal with in a valve hammer than with a valveless hammer, but in the "Little Giant" type this danger has been reduced to a minimum, by dispensing with a valve block and inserting the valve bushing direct into the handle, whilst the cylinder portion A is securely fixed to the handle F by means of a sleeve K. Another feature of this hammer is the economical use of the compressed air, due to the cushioning of the moving parts taking place on the exhaust air rather than from the admission of live air, and taking this in connection with the solid construction of the valve, the same being well cushioned in both directions of its travel, the "Little Giant" type is likely to prove both an economical and a good wearing hammer.

"Boyer" Hammer.—Figs. 9 and 10 show sectional views of a "Boyer" hammer, in matic appliances during the past six which the following letters of reference indicate the various parts referred to—Fig. 9: A, the working cylinder; D, the handle; G, the air passage from throttle valve to cylinder; G^1, throttle valve; H, trigger actuating same; I, the valve block; I^1, cap at end of same; K, the working tool; M, the piston, consisting of a solid piece of turned steel fitting the bore of the cylinder and provided with a recess M^1; O, the valve; P, passage from cylinder to small space e; Q, passage from cylinder to small space n; R, passage from front end of cylinder to small space m; S, port leading from space e to front of cylinder through passage R; T, passage from cylinder through U to space e; T^1, from air-supply to cylinder; X, from air-supply to e.

X is only necessary to supply fluid to front end of piston via S and R and to hold the valve in rear position. Other letters on the drawings are referred to in the following description of the working of the hammer:—Fig. 9 represents the piston in its forward, and the valve in its rearward position. The air having been admitted passes along the passage G and then through W into space e^1 and acts on small area d of the valve O, and tends to force the valve forward, but fluid pressure

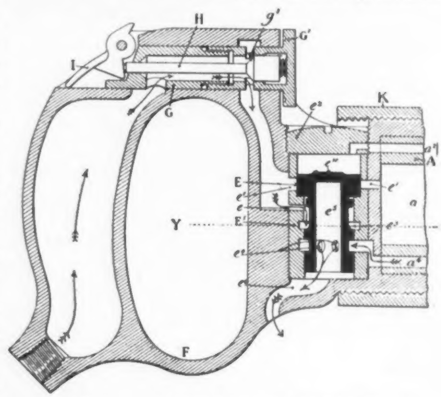


FIG. 5. "LITTLE GIANT" HAMMER. RETURN STROKE.

in space e admitted by the passage X acting upon the large area c of the valve O will hold the valve in the rearward position against the pressure acting on the small area d. The air will pass from space e through passage S and R to the front end of the piston driving the latter backward, the rear end of the cylinder being open to exhaust through the slots e in valve O and groove h, the latter being constantly open to the atmosphere through passages i, j, k. As the piston moves backwards, it uncovers ports P and Q, and the pressure in front end of cylinder will exhaust through passage Q via the groove n and passages o, i, j, k, to the atmosphere; the front end of the passage P will be uncovered by the front end of the piston at

the same time as the front end of the passage Q and the fluid in space e will escape through passages P Q, groove n, and passages o, i, j, k, to the outer air. Passage P being larger than passage X by which the air is supplied to the space e, the pressure on the large area c of the valve O will be greatly diminished, so that the pressure

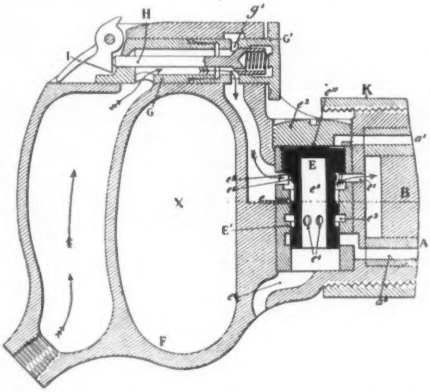


FIG. 6. "LITTLE GIANT" HAMMER. READY TO STRIKE, PISTON AND VALVE IN EXTREME POSITION.

acting on the small area d of the valve O will force the valve forward to such a position that the ring b of the valve O will close the passage X and cut off the supply of air to space e, thereby permitting pressure at d to hold the valve in the forward position. The annular space p will now be opened from which air pressure via W and e^1 will pass to the interior of the valve, and acting on the rear end of the piston will first bring it to rest forming a cushion and later drive the piston forward. As the piston moves forward and finally strikes a blow on the chisel the air in front can escape through passage Q until the latter is closed by the front end of the piston and thereafter can escape through passage R, grooves m, a and n, and passages o, i, j, and k, to the atmosphere. When the piston is moved so that T and T^1 are in communication via groove M^1, air under pressure will pass via T^1, M^1, T and U to space e, and acting on the large area c of the valve O will overcome the constant pressure on its small area d and force the valve backward, and thus open X, admitting more air to space e to hold the valve in that position; also air will pass from e to R via S and to the front end of the piston to assist in driving the piston back. The recoil accomplishes most of the return of the piston. During the backward movement of the piston, the end of the cylinder is open to exhaust through slots l in the valve O and groove h and passages i, j, k, until the passages P and Q are uncovered by the front end of the piston, at which time the valve opens, and, admitting air, arrests the piston and drives it forward. Although communication between T and T^1 is cut off almost directly the piston commences its backward movement, the valve O will not change its position (from rear to front) because sufficient air pressure is passing into space e through passage X to hold the valve notwithstanding the escape of the air via S, since the latter is of less capacity than X. It will be readily understood that the action of the compressed air along the passage G, acting first on one area and then on another area of the valve O, drives it in alternate directions, and that the valve in turn admits air to either end of the cylinder; at the same time the pis-

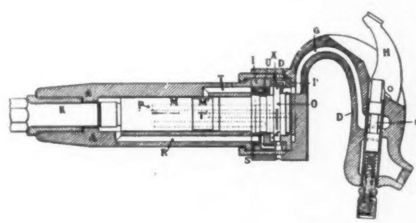


FIG. 9. "BOYER" HAMMER.

ton opens and closes certain ports in the cylinder as in the case of the valveless hammer, and the combination of the dual motions of the valve and the piston produces the desired result of causing the piston to rapidly reciprocate and deliver a number of blows upon the tool K. In this hammer it will be noted that the striking piston passes through the valve, which has the effect of increasing the stroke of the piston as compared with the original design of the hammer (in which the valve was arranged in a separate chamber immediately in the rear of the piston chamber) and without increasing the overall length. In order to effect a cushion on the piston on the rearward stroke live air is admitted before such stroke is com-

pleted. With regard to the valves, owing to their extreme lightness and shortness of stroke, it is stated that cushioning of the valve is unnecessary.

Having now described four representative types of hammers which may fairly be said to cover the types at present in use, it may be interesting to refer to Table I (below), showing sizes and air-consumption, but in regard to these the author wishes to point out:—(1) That they are as given by the different makers. (2) That the claims as to air-consumption can only be sustained when the tools are in the hands of competent workmen, as otherwise the air consumed may greatly exceed the quantities given. (3) That the air-consumption is not alone indicative of the efficiency of the tool.

The author, however, while putting against each maker the amount claimed by him as being the amount of air consumed, is inclined to think that these amounts may be a little exceeded, and in any case pro-

TABLE I.—Table showing sizes, weights, and approximate air-consumption of Hammers.

Type.	Description Number.	Length of Stroke.	Diam. of Piston.	Weight of Piston.	Estimated Speed.	Air Consumption in Free Air	Weight of Hammer.
		ins.	ins.	ozs.	Blows per min.	cub. ft. per min.	lbs.
"Ross" Fig. 1.		7/8	1 3/4	2 1/2	11,000	30	11 1/2
		13/16	1 5/8	2	"	25	10 3/4
		3/4	1 1/2	1 3/4	"	18	10 1/2
		11/16	1 3/8	1 1/2	"	15	6 1/2
		5/8	1 1/4	1 1/4	"	13	6
"Q and C." Fig. 2	Single Hammer C	1	1 1/2		10,000 to 15.000	12	5 3/4
	Single Hammer D	1/2	1 1/2			12	5 1/4
	Single Hammer F	1/2	1 1/4			10	3 1/2
	Double Hammer A	1	1 3/4			18	10 3/4
	Double Hammer C	1	1 1/2			15	9 1/4
"Little Giant." Figs. 3 to 8	0	5	1 1/8	20	1,200	20	16
	1	4	1 1/8	16	1,500	15	12
	2	3	1 1/8	14	2,000	15	9 1/2
	3	2 1/4	1 1/8	14	2,000	15	8 1/2
"Boyer." Fig. 9.	000	5	1 5/16	34	1,000	20	26
	0	5	1 1/16	23 1/2	1,800	20	13
	1	4	1 1/16	17	2,200	15	9 3/4
	2	3	1 1/16	13	2,600	15	8 1/4
	3	1 3/4	1 1/16	13	3,000	12	8 1/4
	B	2	1 8/16	12	3,500 to 5.500	10	8
	BB	1 3/4	1 1/16	8		10	6 1/2
	F	1	3/4	4		10	4
	U	3/4	5/8	3		10	3

vision must be made for leakages, &c.; it is therefore not advisable to cut down the air supply to these amounts, and in actual practice some margin must be provided over and above what the experimental trials would seem to indicate the tools require.

Some reference must now be made to vibration, and its effect upon the operator. Some hammers vibrate more than others, but even in the best the shock is noticeable. Its effect, however, is greatly reduced as soon as the operator learns how to use the hammer to its best advantage, and it is probable that no injury will be done to the operator as soon as he has adapted himself to its proper handling. The purposes to which these hammers may be applied are many, and include chipping, calking, beading, fettling, scaling, riveting,

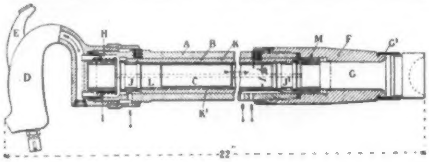


FIG. 10. "BOYER" LONG-STROKE RIVETING HAMMER. 9 INCH STROKE.

stone-dressing and carving, driving plug-holes in stone, planishing brass and copper, driving nails and spikes, &c. To whatever purpose the hammer may be put, it is necessary to remember that proper efficiency can only be obtained by selecting hammers of suitable weight and stroke for each class of work. No tool can be adapted to all classes of work. It is not uncommon to find operators attaching blame to a tool on account of its failing to successfully do its work when the real cause of failure is due to the application of the wrong tool. For results of work done by hammers in calking, chipping, &c., reference must be made to Table IV., in next issue.

Riveters.

Compressed air has long since been recognized to possess great advantage for the purposes of riveting. Portable pneumatic riveters may be divided into two types, namely, those that effect their purpose by squeezing, and those that have a percussive action. The former type are well known, and it is therefore proposed to consider only the latter. These again may be subdivided into (a) hand-riveters, used in conjunction with a pneumatic holder-up, and (b) yoke riveters.

Hand Riveters.—The hand-riveter is simply a heavy pneumatic hammer fitted with suitable snaps, and therefore it becomes unnecessary to describe its mechanical action. It should be mentioned, however, that when used for riveting air-pressure up to 100 to 125 lbs. is advantageous. In the hands of a skillful operator, this tool will be found exceedingly useful, as it can be extensively used in shipbuilding and constructional ironwork to drive rivets in places inaccessible to a yoke or bear riveter. At the same time, in the hands of an incompetent or lazy workman, it lends itself to doing anything but satisfactory work, as care is required to avoid making the head of the rivet on one side. It is, of course, necessary to have a holder-up, and this usually takes the form of a simple piece of mechanism consisting of a piston working in a cylinder into which compressed air is admitted, the end of the piston being kept up to the rivet-head by the air pressure.

Under this heading may also be described shell-riveters, which are hand-riveters mounted in a gimbal or suitable pivoted frame, which permits of shell-

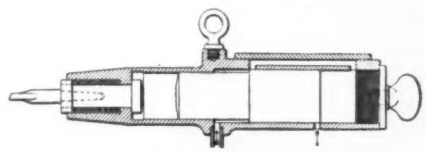


FIG. 11. "FIELDEN" HAMMER 1876.

rivets being driven up to a considerable size, and in places where a yoke riveter is unworkable. These are exceedingly valuable for shipwork.

"Boyer" Long-Stroke Hammer.—All the hammers that have already been described may be used for hand-riveted, but it may be interesting to refer to the 9-inch stroke "Boyer" hammer shown on Fig. 10, in which A is the barrel, B the bushing forming the working cylinder in which the striking piston C works. D is the handle, E the trigger for actuating the admission valve as in an ordinary hammer. F is a nose-piece which receives the stem or shank of a riveting tool or snap G. G^1 is a spring clip which detachably connects F and G. H is an air chamber. I is a sleeve which is actually a second throttle-valve independent of that in the handle. J and J^1 are two valves at the rear and forward end of the cylinder respectively, and these valves control the air-supply to the piston.

They are connected, or have interposed between them, two small rods or wires K and K^1 extending longitudinally through the cylinder wall from one end to the other, so that when the valve J^1 moves backward its movement will be communicated to the valve J, or when the valve J moves forward it communicates a like movement to J^1. The rods are not attached at either end of the valves, although the action would be the same if they were. L is one of the rods which abut at their rear ends against the throttle-valve I and at the forward ends against a sleeve M. It is not proposed to give a full and detailed description of the working parts, since this has already been done when describing the "Boyer" hammer.

It will therefore suffice to say that in order that the tool may start working (the handle throttle-valve having previously been opened) the rivet snap G must be pressed against its work. This opens the throttle-valve I by means of the rods L to

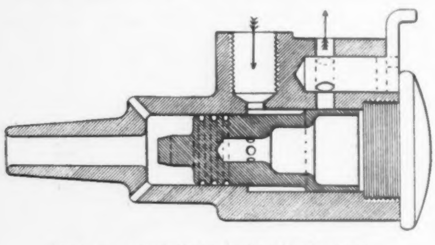


FIG. 12. ATKINSON (CROSSLEY) TOOL.

admit air to the cylinder through the automatic controlling valves J and J^1. The reciprocation then takes place as in an ordinary hammer. By this means the compressed air is not only automatically admitted to the tool by the act of pressing the latter up to its work, but the tool is inoperative unless it is pressed against the work. This provision for preventing operation of the tool except when pressed to its work is of importance, since otherwise the tool might be run without the presence of anything to resist the powerful blows of the long-stroke piston, which might be liable to knock off the entire front end of the tool. The object of the valve at either end is to secure a longer stroke than would otherwise be possible, and is the feature of the hammer. Other forms of hammers are shown in figures 11-13.

Yoke Riveter.—Ordinary yoke riveters are suitable for shipwork and constructional ironwork generally, tanks, gasholders, wagon under-frames, and a variety of other purposes. One arm of the yoke is fitted with what is practically a percussion hammer, while on the other is a solid holder-up. Suitable adjustment of the hammer portion permits of the snaps being the correct distance apart. In a riveter of this type, great as is its value for certain classes of work, no provision is made for closing the plates, except that which may result from the snapping of the rivet; and to obviate this difficulty and to supply the want of a percussive-action plate-closing riveter, the "Little Giant" yoke riveter has recently been made. This riveter consists of an ordinary yoke, having at one end a fixed holder-up and at the other a small frame or yoke carrying a pneumatic hammer, and provided with a special clamping device for clamping the work together during the process of riveting. This clamping device also takes the place of the ordinary pneumatic holder-up.

Its action will be readily understood by a short description, reference being had to the letters shown on the drawing, in which a is the main yoke; a^1 the small yoke or frame carrying the percussion hammer and clamping device g; b a projection of a^1; c an air chamber formed by the extension of the back of the hammer and the projection b; d the said extension of the hammer casing, and which also forms a guide to carry the hammer; *e* the hammer cylinder; f an extension of the coupling sleeve of hammer, and which slides in the other end of the small yoke a^1, and also acts as a guide for the clamping device; h a spring for returning g to normal position when air-pressure is cut off; h^1 the hammer piston; i the tool shaped to form the head of the rivet; j j^1 and j^2 ports for air-supply; k distributing valve; l and m exhaust and supply as in an ordinary hammer; n the rivet.

Its action is as follows: The work to be riveted being in position, air is admitted. This forces the whole apparatus forward until the tool is in contact with the rivet and forces it against the fixed holder-up. At the same time live air is admitted at the back of the hold-up j^1, forcing the clamping device forward, which closes the plates, and permanently holds them in position, whilst the rivet-head is being formed. As the rivet gets shorter the hammer is kept close to its work.

It will be obvious from this description

that although it is not possible to get a very great pressure on the clamping device without increasing the area of the pressing cylinders to an abnormal amount, yet this arrangement possesses very considerable advantages over the ordinary percussion yoke riveter, as it insures that the riveting hammer shall be automatically kept up to its work, and that the work shall be firmly held together whilst the rivet is being driven, both of which are very important points.

Another and very valuable form of riveter is known as the "Little Giant" light yoke riveter, and is the latest development, and should prove an exceedingly useful addition to the pneumatic appliances at present in use. It consists of an ordinary standard type "Little Giant" hammer as used for chipping or riveting, clamped to a light yoke carrying at its other end a pneumatic holder-up. There is also clamped to the yoke a small casing, containing an air-chamber, valve, trigger, and suitable pipe connections for providing compressed-air communication with the hammer and holder-up. The action is as follows: The main air-supply enters the chamber, being admitted past the valve by pressing the trigger, and thence passes to the holder-up and hammer-handle. The holder-up at once brings the rivet into its place, and the operator then puts the hammer in action in the ordinary way by depressing its trigger. The object of this

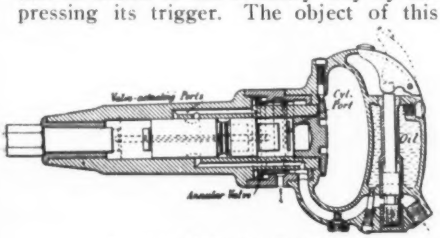


FIG. 13. MONARCH HAMMER.

riveter is to replace a separate holder-up in light riveting work where a yoke is permissible. To deal with such work it has hitherto been necessary either to use a hand-riveter and separate holder-up, thus requiring two operators, or else a yoke riveter, which is generally too cumbersome for one operator. Moreover, it insures that the holder-up first brings the rivet home before the percussion action begins, and also makes it possible to use an ordinary hammer. This would prove a very useful feature should anything go wrong with the percussion mechanism, when the hammer could be easily unclamped and immediately replaced. Such a riveter would close 5-16-inch cold rivets or ⅜-inch hot rivets with a gap up to about 12 inches, and could easily be handled by one man. With regard to the respective advantages of percussion riveters and squeezing riveters, especially of the hydraulic type, there is considerable difference of opinion. In England we have so long been used to hydraulic-squeezing riveters that the percussion-riveter at first met with but scant recognition until its advantages were proved, and the author ventures to think that a solution of the difficulty will be found when the true value of each type for its respective work has been fully recognized. To those who have tried both systems, the pneu-

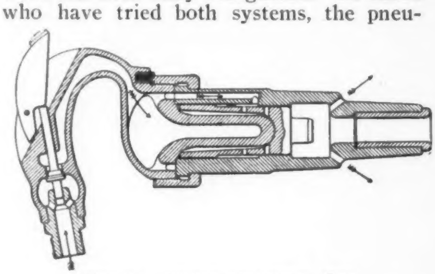


FIG. 14. DUNLOP HAMMER 1895.

matic percussion-riveter has shown itself to possess certain advantages in the form of lightness, portability, convenience in manipulation, and other points over its rival. On the other hand the advocates of the percussion system do not at present claim advantages where the riveted work has to stand high pressure as in boiler work, although the "Little Giant" plate-closing yoke riveter is certainly a step in the direction of using it for this purpose.

Table II. gives a comparison between pneumatic-machine and hand-riveting in the Chicago shipyards.

[To be continued.]

Notes.

The General Compressed Air House Cleaning Company, St. Louis, Mo., sends a pamphlet relating to its apparatus for cleaning, renovating and disinfecting public and private buildings by a dustless method, and cleaning and renovating carpets on the floor. Size, 4¾x7¼ inches.

The Hunt Air Brake Company of New Kensington, Pa., are erecting a new building 60x100 feet to be used as a foundry department. Plans for other additions to this plant have been prepared and will be used for the manufacture of small ice machines to be attached to refrigerators.

The crane department of the Chisholm & Moore Manufacturing Company has taken a contract for a 25-ton 55-foot span pneumatic crane for the Franklin Air Compressor Company, Franklin, Pa. They report an unprecedented demand for their pneumatic hoists.

The Northern Engineering Works, Detroit, Mich., send a catalogue of air hoists and other pneumatic lifting appliances, such as traveling and jib cranes, foundry elevators and jacks. It gives dimension tables and diagrams showing air consumed, etc. The pamphlet is designed to supplement the company's principal crane catalogue.

An important advance in punching appliances and methods is announced. Those familiar with the class of work referred to will recognize the great advantage of the tool built by F. F. Slocomb & Co., Wilmington, Del. This tool is the Caskey Portable Pneumatic Punch, a one-man machine for light and heavy work. It saves power and space and gives increased accuracy of work. Further particulars on a~~l~~ication.

The Federal Compressed Air Company is the name of the corporation which has purchased from the Compressed Air Company of New York the rights under the latter's patent for the State of Ohio. The Federal company are reported to have excellent prospects for business. The officers of the corporation are: President, M. E. Ingalls; vice-president, Col. J. D. Ellison; secretary, W. D. Brickell; treasurer, S. G. McClure.

The General Compressed Air House Cleaning Company, of St. Louis, is exploiting a system of cleaning long used by some of the railroad companies. A stream of compressed air is forced against the article to be cleaned and the dust is blown out. The improvement introduced by the company consists of apparatus for collecting the loosened dirt.

The "Quick-as-Wink" hose coupling has been found to be a time saver in shops where compressed air is used, and is now coming into general use on hose for pneumatic tools and machines. Frick & Lindsay, of Pittsburg, who deal largely in pneumatic hose, have contracted with the W. J. Clark Co., of Salem O., the manufacturers, for a continued supply of these couplings for such purpose.

The Garry Iron & Steel Roofing Company have taken contracts for revolving pneumatic cranes for the Rock Island Railroad, at Bureau, Ill., and for the Canadian & Atlantic Railroad, at Ottawa, Canada. They have recently shipped a pneumatic painting machine to Russia. They are at work on several good contracts for building material and state they expect to close up some large contracts after the first of the year.

A catalogue of air hoists and other pneumatic hoisting appliances is issued by the Northern Engineering Works, Detroit, Mich. This catalogue is intended as a supplement to their crane catalogue, and contains descriptions of the various types of pneumatic hoists and cranes made by this company. Dimension tables and diagrams showing air consumed, etc., are given in detail.

Mr. John Pratt, who enrolled in the International Correspondence Schools, Scranton, Pa., over nine years ago, was recently appointed superintendent of coal mines for the Mexican International Railroad Company at Fuente, Mexico. He was assisted in securing the position by the Students' Aid Department of the schools. Mr. Pratt was the sixth student enrolled in the complete coal mining course.

The Standard Railway Equipment Company, St. Louis, Mo., finds that its present facilities for the manufacture of pneumatic tools is not sufficient, and contemplates the removal of the plant to another location. Several locations in St. Louis are under consideration, and the matter will be decided within a short time. The company has offices for the sale of its Monarch pneumatic tools in New York, Pittsburg, Philadelphia and Chicago, the latter office being under the management of C. C. Murphy.

The Philadelphia Pneumatic Tool Company has recently placed orders for a number of special machine tools for their shops. They have also opened an office recently in Pittsburg at 1 Wood street, in charge of Mr. John K. Henry. Heretofore they have been represented in that city by an agency only. This company expects to open an office in Chicago at an early date.

Mr. J. Wilbur Tierney, president of the company, sailed for Europe on Feb. 6 to look after foreign connections of the company.

The York Manufacturing Company, York, Pa., has sent a pamphlet relating to its ice-making, refrigerating and other machinery. In the last-mentioned class reference is made to engines, air compressors, boilers, tanks and special machinery for paper and powder mills, cotton compressors and sugar refineries. The standard York ice-making and refrigerating machine is of the compression type, with single-acting vertical compressors and horizontal engine. It is extensively shown here in half-tone and fine-line cuts.

The Raymond Manufacturing Company, Middletown, Pa., manufacturers of machinery castings, steam heating apparatus, etc., have purchased a 15-ton electrical traveling crane and are installing the same in their foundry, and expect to have it in position by Jan. 15. They are also purchasing and installing at the present time a complete air system throughout their entire works for chipping, riveting boilers, calking boilers, cleaning castings and ramming large molds in their foundry. They have also greatly enlarged their foundry and are improving it in many other ways.

The Standard Pneumatic Tool Co., of Chicago, manufacturers of the "Little Giant," Air Tools and Appliances, have moved their New York offices from 619 Washington Life Building, to more commodious quarters at 611-612-613 of the same building, this being necessitated on account of the very great increase in their business in Eastern and Foreign territory during the past few months. All shipments for customers in the district just mentioned will be made from New York instead of Chicago, thus expediting the delivery of machines.

Application for a charter for the Electro-Pneumatic Company of Connecticut has been made to the General Assembly of that State. The company are said to command $1,000,000 capital, and they propose to inaugurate a service for the transmission of merchandise and other articles through pneumatic tubes. The plan is to run the main tube from New York to Hartford, through Bridgeport, New Haven and Meriden. One of the features of the project would be the practically instantaneous delivery of newspapers from New York to the large cities in Connecticut.

In delivering air for short distances through pipes (say under 500 feet) the same results may be expected—approximately—under similar conditions of head, diameter of pipe, curves, etc., as if the material were water. But for longer distances, if the item of leakage be eliminated from the calculation by good joints, better results may be expected from air. This is due to the lesser density of the air when compared with water.

The Philadelphia Pneumatic Tool Company has lately sent out a series of detached sheets illustrating and describing its rotary drills, powerful types and specific instances and illustrations of their use; chipping, riveting and calking hammers, with sizes, weights and capacities, and hand or suspended pneumatic rammers for foundry work, the application being also illustrated. Various conditions of work are considered in the several fields and the company proposes to design suspension for tools in special cases.

Pedrick & Ayer, manufacturers of air compressors, hoists, riveters, etc., continue very active in all branches of their trade. Inquiries keep up pretty fairly, although there has been some falling off in the foreign demand, which until recently has been exceptionally heavy with them. Local trade is, however, very active and this year's business is far ahead of that of last year. Among recent shipments may be mentioned a large open side planer for the Bethlehem Steel Company. This tool is 18 feet in length over all and has a working length of 12 feet and width of 42 inches. Shipments of a number of pneumatic compression riveters have also been

made, several for Detroit, Mich., delivery and a number for the Toledo Bridge Company, Toledo, Ohio.

At the recent annual meeting of the Philadelphia Pneumatic Tool Company, Philadelphia, the board of directors was increased from three to six members. The new directors are Thomas Scattergood, Julius Keller and A. L. Phillips. The latter two were brought into the company through the purchase by the Philadelphia Pneumatic Tool Company of the capital stock and the plant of the Keller Tool Company, who have heretofore been manufacturing pneumatic tools exclusively for the Philadelphia Pneumatic Tool Company. This consolidation of the interests of the two companies gives the latter company entire control of the manufacturing as well as of the selling of the product.

The same officers were re-elected, viz., J. W. Tierney, president; R. T. Mickle, vice-president; J. H. Mickle, secretary-treasurer.

The King Bridge Company, manufacturers of steel bridges, are at work on improvements which will increase their capacity fully one-third. The Rand Drill Company have recently installed in their plant a complete air compressor equipment and a number of pneumatic tools. They are at work on a number of new bridges for the New York, New Haven & Hartford, Lake Shore and New York Central railways, and are building a large rolling lift bridge for the Big Four Railway in this city. It will be 175 feet long, and will have a 100-foot opening. They have just closed a contract for 3,000 tons of bridges for a new electric railway, the name of which they are not yet prepared to announce. The closing of this contract was dependent on the result of the election. They state that since the election there has been a decided improvement in business, and they are assured that a number of important contracts will be closed shortly after the new year.

Motor-Driven Air Compressors.—New catalogue, just issued by the Westinghouse Air Brake Company, illustrates and describes a line of small electrically operated air compressors for supplying compressed air for car brakes, train signals and various industrial uses. The motor and compressor, which are discussed separately, were designed to occupy the smallest possible space and are illustrated by several different views. An automatic electric pump governor is described and shown separately by a half-tone engraving and also in connection with a diagram of wiring and piping, which explains the method of connecting up the compressor to run from a direct-current trolley circuit, either on a car or in a car station. The pamphlet also gives general directions for starting the compressor and a table of weights and dimensions of the different sizes of motor-driven reciprocating air pumps, manufactured by the Westinghouse Air Brake Company. The pamphlet is in the usual tasteful style of the Westinghouse companies.

Oxyliquit is the name under which liquid air, absorbed by some suitable material, was lately used in Germany as a blasting agent. The Prince Regent Bridge at Munich had suffered from the high flood of the Isan, and large bulks of stone and concrete had to be blasted. The cartridges were made of paper, filled with an oily mass and provided with a primer. When everything was nearly ready, the liquid air was brought down to the river in a vessel fitted with a vacuum jacket and the cartridges placed in it. They were soon taken out again, fixed in the usual manner, and fired by the electric spark or by a Bickford fuse. The effect is said to have been equal to that of dynamite. The work was carried out under favorable circumstances, and as there was no danger until the cartridges, which are in themselves harmless, were fully prepared, the police safety regulations were relaxed. If a cartridge missed fire it turned harmless again within a quarter of an hour, because the air evaporated rapidly. That is an advantage on the side of safety, but otherwise a disadvantage. It resulted that just for this evaporation the effect was somewhat uncertain. The power of the explosive rapidly decreases with the period occupied in fixing the impregnated cartridge.

A Pneumatic Attachment for Gold Dredges.—Mr. J. A. Miller, in the New Zealand Mines Record, describes Ridland's patent pneumatic rock scraper, designed for the purpose of getting gold

out of a hard crevassy rock, which the dredge-bucket cannot break up and remove. The rock scraper will also assist materially in the removal of large rocks and stones below the water level. The apparatus consists of an iron tunnel swinging upon an axle, which allows the lower end or mouth of the tunnel to be raised or lowered at will, being able to reach to a depth of sixty-five feet. The mouth of the tunnel is enlarged to a size sufficient to cover a big stone, and allowing room for the workmen to work around it. The water is expelled and kept out of the tunnel by pneumatic pressure, and when the bottom is reached, or at any other stage of the work, the men enter the tunnel to do whatever may be required, whether it be the removal of stones or scraping up the bottom. To raise any material to the deck of the pontoons a truck running on rails is used. The tunnel is supplied with the electric light, the telephonic communication is provided between the men at the bottom and those upon the deck of the pontoons. The scrapings off the bottom are landed in a receptacle provided for the purpose, and being the richest part of the wash, may be treated with especial care, so as to guard against the loss of any gold.

The equipment of the heavy trains with air brakes has also been the source of considerable business during the year. Besides the increased activity in the manufacture of air brakes, builders of air compressors have also been benefited. Numerous plants have been built along the various routes to be used as testing stations, all of which required the installation of air compressors. Several roads have adopted systems of cleaning their cars by means of comprssed air and this has further increased the demand for compressors. The wide use of pneumatic tools, which the year of 1899 has advanced considerably, has also been of much benefit to the builders of compressors. That the pneumatic tool business has figured most prominently in the year's activity is evident. Builders of the tools have added materially to their productive capacity and have thus figured as good customers to the machine tool trade. They have also made extensive arrangements for the introduction of their product abroad, in some instances plants having been erected in Europe for the manufacture of the tools. Among the chief uses of pneumatic tools the shipbuilders have been most prominent. The large establishments in this country have adopted them freely and the great European shipyards have also installed them extensively. The Russian Government, it will be recalled, placed an order with an American concern for $300,000 worth of hammers, drills, riveters, etc. Pneumatic tools have also been employed extensively in the building of gas holders, in bridge building, and in other forms of structural engineering.

COMMUNICATIONS.

Under this heading will be published inquiries addressed to the Editor of COMPRESSED AIR. We wish to encourage our readers in the practice of making inquiries and expressing opinions.

We request that the rules governing such correspondence will be observed, viz.: all communications should be written on one side of the paper only; they should be short and to the point.

Compressed Air, No. 26 Cortlandt St.,
New York City:

Gentlemen—Will you kindly favor us with the name of the manufacturer of the Continuous Pneumatic Forge described on page 1222 of your issue of February, 1901, and oblige, very truly yours,

EMPIRE ENGINE & MOTOR CO.,
By G. L. Miller.

U. S. PATENTS GRANTED JAN., 1901

Specially prepared for COMPRESSED AIR.

11,887. PNEUMATIC HAMMER. Arthur C. Beckwith, Chicago, Ill., assignor to the Missouri Railway Equipment Company, St. Louis, Mo. Filed March 16, 1900. Original No. 559,660, dated May 5, 1896.

665,033. PNEUMATIC TOOL. Charles B. RICHARDS, Cleveland, Ohio, assignor to the Cleveland Pneumatic Tool Company, same place. Filed Dec. 6, 1899. Serial No. 739,410.

A pneumatic tool, the combination with a barrel formed with a plunger-cylinder and a valve-casing arranged in axial alinement with and at the inner end of said barrel, of a plunger reciprocating in the barrel, a distributing-valve reciprocating in the valve-casing, and means for causing the valve to be thrown forward immediately following the forward throw of the plunger, thereby neutralizing the back jar from the plunger striking the tool, substantially as set forth.

665,281. PNEUMATIC TOOL. John S. Stevenson, Detroit, Mich., assignor to the American Car and Foundry Company, same place. Filed Oct. 8, 1900. Serial No. 32,445.

665,285. PNEUMATIC OIL-PUMP. George W. Turner, Dayton, Ohio, assignor of one-half to John P. Steffen, same place. Filed May 7, 1900. Serial No. 15,696.

A measuring apparatus, the combination of the air-pump, the tank, the compression-chamber inclosed and resting on the bottom of said tank, the valve opening into said chamber and the conduit leading therefrom, and the overflow-conduit connecting top of the measuring vessel with the tank.

665,391. CASING FOR PNEUMATIC HAMMERS. Frank J. Chapman, Philadelphia, Pa. Filed May 4, 1900. Serial No. 15,556.

A pneumatic hammer, the combination with a hammer-cylinder, of a casing and resilient cushions arranged at the opposite ends of the cylinder between the same and the casing.

665,332. AIR-COOLING DEVICE. Silas B. Waters, Cincinnati, Ohio. Filed Sept. 11, 1900. Serial No. 29,714.

An air-cooling device for ventilating systems comprisng an air-pump, a chamber inclosing said pump and having walls of porous material, an overflow-trough arranged around the top of said wall, and a supply of water whereby the porous wall is kept wet and the supply of air for the pump flows therethrough in contact with the water.

665,448. COMPRESSOR.—John G. Lapham, New York, N. Y., assignor to the Lapham & Schroeder Manufacturing Company, of New Jersey. Filed March 3, 1900. Serial No. 7,159.

A compressor, a compound, adjustable, cushioning piston, having an upper section or cap screwing into a middle section or body, securing a bull-ring and packing-rings, a lower section or guide secured by a bolt and nut to said middle section or body, and a spiral spring interposed between said lower and middle sections.

665,564. PNEUMATIC HAMMER. Jean Beche, Jr., Huckeswagen, Germany. Filed Aug. 17, 1900. Serial No. 27,224

A pneumatic hammer, the combination of a cylinder provided with a partition b, cock o and valves k, l and m and passages m1 and m2, a hammer, two pistons d e connected to said hammer by a piston-rod f guided by the partition, and another piston c in the cylinder.

665,852. TRAIN SIGNALING APPARATUS. William A. Harris and Benjamin S. H. Harris, Greenville, S. C. Filed June 23, 1900. Serial No. 21,342.

A signaling apparatus for a fluid-pressure brake system, comprising a casing in communication with, but out of the line of the main train-pipe whereby to avoid the dirt in the air passing back and forth in the main train-pipe, the signal, and devices in said casing by which to effect the operation of the signal by the proper reduction of pressure in the train-pipe.

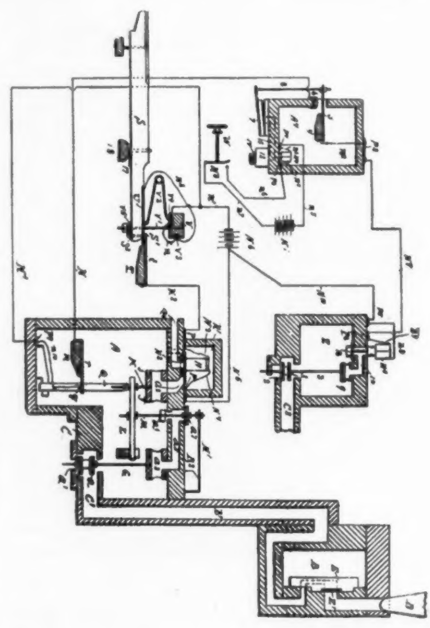
666,549. AUTOMATIC COMBINED STEAM AND AIR VALVE FOR RADIATORS. Robert S. Parks, Fitchburg, Mass. Filed April 3, 1900. Serial No. 11,347.

666,588. ROTARY PUMP FOR AIR, WATER, &C. James Aitken, The Breakwater, near Geelong, Victoria. Filed May 28, 1900. Serial No. 18,339.

A rotary pump for air, water or other fluid, a casing provided with suitable inlet and discharge ports, a pair of spindles arranged in said casing and each of which is provided with screw-threads of gradually decreasing depth toward the discharge end thereof, a passage or way H connected to said casing, and a continuous belt of traveling stops or fingers arranged in the said way and casing and adapted to engage the said threads.

666,658. ELECTROPNEUMATIC ORGAN ACTION. William B. Fleming, Detroit, Mich. Filed Jan. 15, 1900. Serial No. 1,467.

An organ provided with an electromagnet and a battery in electrical connection therewith, the combination of a key provided with a contact-plate in electrical connection with said battery, a contact-bar pro-



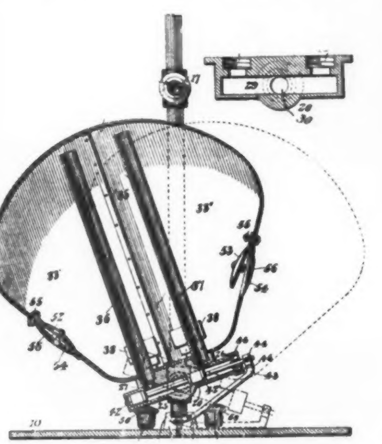
vided with a contact-finger in electrical connection with the magnet, said key provided with a non-conductor upon which the contact-finger may normally rest, said contact-plate forming electrical contact with said contact-finger when the key is depressed.

665,959. GAS-COMPRESSING MACHINE. Samuel D. Flood, Chicago, Ill., assignor to the A. H. Barber & Company, same place. Filed Feb. 18, 1898. Serial No. 670,758.

665,993. FLUID-PRESSURE HOIST. Niels A. Christensen, Milwaukee, Wis. Filed June 18, 1900. Serial No. 20,719.

A hoist, the combination with a cylinder having a piston traveling therein, which is actuated by the admission of a fresh supply of fluid-pressure at each lifting operation, of means for admitting such fluid-pressure into the cylinder against one side of the piston and discharging all the exhaust into the cylinder on the other side of the piston, but at a point below the end of the cylinder, such cylinder having a separate inlet and outlet for said exhaust.

666,659. COMPRESSED-AIR WATER-ELEVATOR. Horace L. Frost, Bristol, Tenn., assignor to the National Pneumatic Pump and Manufacturing Company, of Tennessee. Filed Jan. 17, 1900. Serial No. 1,792.



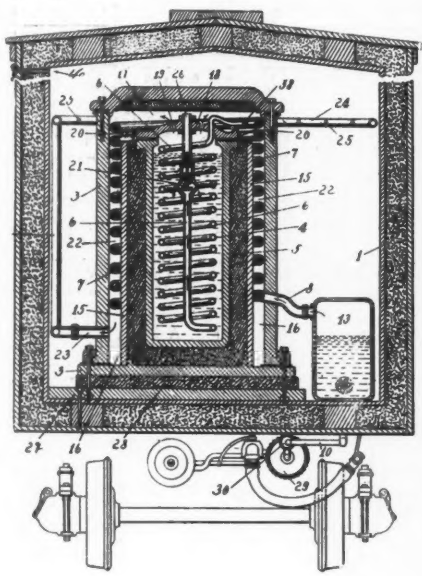
A liquid-elevating system, the combination with a rocker-plate provided with inlet and outlet passages, of a divided vessel supported by the rocker-plate, and valve mechanism directly supported by the plate and operated by the oscillations of said plate to control the inlet and outlet passages.

666,690. ENGINE. Charles K. Pickles, St. Louis, Mo., assignor of one-half to the Q. & C. Company, Chicago, Ill. Filed Feb. 6, 1899. Serial No. 704,715.

A portable pneumatic engine of the character herein described, the combination of a cluster of three or more engines having parallel relation with the axis of the drill, a series of crank-shafts radially arranged, connections between the crank-shafts and the pistons of the engines, and connections between said crank-shafts imposing isochronal movement upon the same

666,692. APPARATUS FOR COOLING BY LIQUID AIR. James F. Place, Glenridge, N. J., assignor to James Cavanagh and Samuel Weil, trustees. Filed Aug. 17, 1900. Serial No. 27,119.

An apparatus for cooling by liquid air, the combination, with the compartment to be cooled, or a liquid-air condenser com-



prising a liquid air reservoir adapted to receive an initial charge of liquid air, a submerged liquefying coil therein and delivering thereto, and a counter-current apparatus whose high-pressure conduit is connected with an outside source of compressed air and with the liquefying-coil, and whose low-pressure conduit is connected at one end with the liquid-air reservoir and at the other end with cold air-distributing pipes delivering into the compartment.

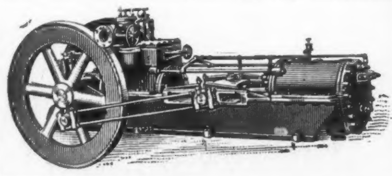
666,693. APPARATUS FOR COOLING BY LIQUID AIR. James F. Place, Glenridge, N. J., assignor to James Cavanagh and Samuel Weil, trustees. Filed Aug. 29, 1900. Serial No. 28,445.

666,747. CARRIER FOR PNEUMATIC DISPATCH TUBES. Edmond A. Fordyce, Chicago, Ill., assignor to the American Pneumatic Service Company, Boston, Mass. Filed Nov. 5, 1900. Serial No. 35,-472.

666,757. MOTIVE FLUID-OPERATED HAMMER. Charles H. Johnson, Chicago Heights, Ill., assignor to the Johnson, Parfitt Tool Company, Springfield, Ill. Filed March 2, 1900. Serial No. 7,081.

666,840. FLUID-ACTUATED MOTOR. Horace L. Arnold, New York, N. Y., assignor to John A. Hill, same place. Filed April 9, 1900. Serial No. 12,171.

667,133. PNEUMATICALLY CONTROLLED TROLLEY. John B. Linn, Schenectady, N. Y., assignor to the General Electric Company, of New York. Filed Nov. 13, 1899. Serial No. 736,776.



Couldn't Get Our Sample Back.

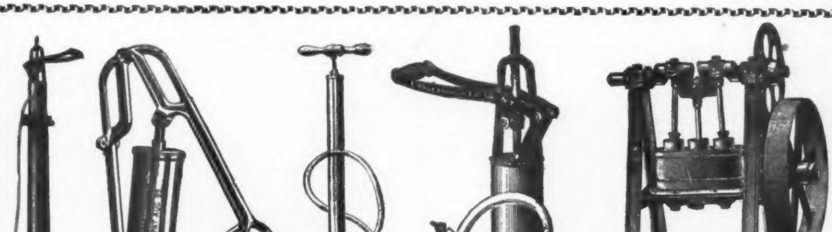
Our salesman recently left his sample hammer over night at a machine-shop where he had shown it. He went for it the next day, but they refused to give it up, and told him to send them bill for it. They had tried three kinds on some urgent work, and ours was the only one that would do the work.

Prove our tools at our cost. Send for one on trial, and return it if it doesn't do better work than any other kind.

Send for Catalog of our Pneumatic Chipping and Riveting Hammers, Piston Drills, Rotary Drills, Rammers, etc.

PHILADELPHIA PNEUMATIC TOOL CO.,

NEW YORK, PHILADELPHIA, PITTSBURG, BOSTON.



COMPRESSED AIR PUMPS FOR ALL PURPOSES.

GLEASON-PETERS AIR PUMP CO., 20 West Houston Street, N. Y.